Notebook, N-10-02-24

This undated notebook was probably used during February 1910 and was annotated at least once after that date. All entries are by Edison, and many entries were later marked "Ent[ered]" and copied by him into the undated notebook, N-19-04-20.1. Included are a log of storage battery cell tests and extensive notes regarding the chemical reactions involved in the discharge and charge of the battery cells. Inserted into the book are loose notes by Edison and a one-page entry by Walter E. Holland, dated February 1910, regarding the cell tests. The front cover is marked "Iron" and is labeled "Iron Book." The pages are unnumbered. Approximately 60 pages have been used.

		Rate 300	Cold	Rate 750	
6 Mi Tubes			½	I v	½ v
5 grams sem percent Hg	4553	1910	2750	50	100
2% Hg	4554	1920	2775	37	100
				44	
3%	4555	1980	2905	62	125
	4556	1950	2870	62	125
4%	4557	1990	2950	825	1212
	4558	1950	2895	262	412
5%	4559	1915	2840	1037	1537
	4560	1950	2890	1050	1550
				1040	
6%	4561	1885	2790	1150	1787
	4562	1925	2840	1150	1775
7%	4563	1915	2840	1312	1937
	4564	1945	2930	1300	1937
8%	4565	1895	2780	1387	2050
	4566	1885	2800	1312	1975
9%	4567	1835	2685	1337	1987
	4568	1865	2735	1287	1912
10%	4569	1835	2675	1300	1937
	4570	1775	2580	1250	1873

50						100			
	300		750			300		750	
			1½	½				1½	½
4553	1635	2230	825	1312		1530	2130	162	250
4554	1700	2375	950	1437		1545	2135	425	575
								293	
4555	1845	2670	1275	1937		1720	2510	1037	—
4556	1740	2530	1025	1537		1640	2450	75	112
			650					538	
4557	1845	2715	1312	2000		1665	2460	962	1425
4558	1800	2600	1125	1700		1645	2375	200	312
			1237					580	
4559	1860	2700	1212	1875		1610	2310	775	1162
4560	1845	2670	1325	2012		1616	2285	550	1237
			1270						
4561	1885	2700	1262	1987		1630	2295	950	1412
4562	1850	2700	1412	2112		1630	2365	437	1537
			1335						
4563	1885	2770	1500	2262		1600	2315	837	1287
4564	1850	2730	1350	2125		1600	2300	525	1250
4565	1845	2685	1475	2237		1530	2200	837	1300
4566	1840	2660	1487	2212		1560	2260	900	1387
4567	1800	2610	1425	2187		1505	2145	737	1187
4568	1780	2620	1425	2150		1600	2350	962	1537
4569	1750	2475	1450	2212		1560	2235	950	1462
4570	1720	2515	1362	2087		1485	2100	812	1237

150				
300		750		300
		1½	½	Hour
900	1190	187	275	1725
1010	1350	237	350	1925
		212		
1410	2050	350	550	2525
1330	1940	267	450	400
		318		
1360	2000	437	675	2410
1240	1815	212	337	1725
		324		
1325	1815	550	860	1825
1320	1845	650	987	2200
		600		
1390	1965	512	800	2400
1335	1900	437	675	2105
		444		
1325	1845	437	687	2400
1260	1810	512	812	2130
		474		
1200	1685	525	825	2205
1320	1900	737	1162	2375
		631		
1150	1595	412	825	1645
1265	1830	650	1025	2140
		53		
1150	1585	500	775	1840
1195	1680	662	1050	1885
		540		

200 Run

	300	1/2	750	1/2	Hot
4553	985	1200	112	200	1320
4554	1050	1240	187 / 149	275	1385
4555	1385	1990	412	650	1280
4556	1365	1990	237 / 324	375	1503
4557	1425	2090	525	812	1555
4558	1345	1890	112	187	1335
4559	1440	2040	575	887	1315
4560	1315	1845	225	362	1885
4561	1350	1860	112	225	1940
4562	1310	1840	100	157	1725
4563	1300	1815	125	200	1810
4564	1300	1880	225	375	1665
4565	1155	1580	162	275	1860
4566	1245	1765	500	787	1880
4567	1230	1655	150	275	1450
4568	1320	1910	187	337	1615
4569	1185	1625	137	237	1620
4570	1200	1690	337	562	1545

250 Run

	300	1/2	750	1/2	Hot	
2/1	585	635	125	200	1160	4568 } dredging fully
	765 / 675	955	225 / 175	287	1215	4564 } took out 72 & put on hot plate 48 hours — Remoulded & Run Reg — No better
3/1	1110	1550	362	512	1780	
	1090 / 1100	1525	212 / 287	325	1735	
4/1	1150	1615	300	437	2200	4565 Same as above
	980 / 1065	1315	125 / 212	200	1850	4566 Except worked free of Roll after discharge
5/1	1140	1660	462	700	1635	Improved 19% on 14
	1060 / 1100	1440	362 / 412	525	1815	
6/1	1100	1500	350	475	1640	4567-8 Same as 4565-Then Corrugated very fine —
	1050 / 1075	1425	287 / 318	450	1640	Improved 14 & 16%
7/1	1050	1400	200	350	1660	
	1130 / 1090	1550	300 / 250	462	1640	
8/1	940	1250	225	337	1800	
	1065 / 1002	1480	500 / 362	750	1770	
9/1	950	1235	225	375	1350	
	1060 / 1005	1460	237 / 231	375	1580	
10/1	865	—	125	275	1500	
	980 / 922	—	450 / 287	687	1460	

Iron book 4508 mm
Remarks
4573 to 4579 Tamped with
Various weights and runs
~~about~~ 650 Runs, gave
about the same results

			600 Run	
			1V	X
6 lbs	13 oz	10,090	2070	2500
			2.00	2.400
5 lb				

Very blind see book
+ study out

50 — 69.28%

		1V 750	1V 300	½V	1V 750	1V 300	½V	
1196 Fe Mix 5 gms on pockets that have NOT been nickel plated	4589	1112	1790	2525	1225	1800	2600	
	4590	1100	1745	2510	1125	1710	2500	
	4591	1150	1790	2570	1125	1700	2400	
1196 Mix Fe 15% Bismuth hydroxide mixed 5 gms of each	4592	237	280	495	362	615	900	Co
	4593	237	280	495	400	700	985	
1196 Fe - 25% Bismuth hydroxide 5 gms	4594	175	220	525	250	460	820	Co
	4595	200	235	555	337	645	1050	
Fe No Hg mixed 25% Bismuth hydroxide put up 4 tablets 5 gms	4596	12	60	285	12	45	235	Co
	4597	12	65	300	12	45	200	
1196 put up in pockets that have been silver plated 5 gms	4606	925	1640	2380	250	1165	1550	75.1%
	4607	1000	1665	2440	687	1590	2295	
Dup 4606 Except use Iron that has No Hg	4608	1350	1940	2815	1237	1900	2810	69
	4609	1225	1885	2635	975	1800	2500	
1196 Fe mixed with 5% very finely divided Red Oxide iron	4610	875	1490	2150	687	1300	1800	
	4611	900	1535	2180	912	1720	2225	

	100	1/2	1ft	150	1/2
4589	1500	2145	1420	1385	1945
4590	1375	1950	1325	1205	1830
4591	1560	2235	1400	1360	1920
4592					
4593					
4594					
4596					
4606	470	555	1145		
4607	500	575	1175		
4608	125	150	1150		
4609	25	50	1150		
4610	785	1000	1155		
4611	1100	1430	1195		

This appears to should
Cannot use ~~Iron~~ Iron, as
Neg in Ni bolling
Must use Cadmium Cobalt
or something else
used in tail 4 yr tube when Gr used

In big cell the room loses
Capacity in last a yr or
hence use not no results.
in big Cell - with Bromuth

5 ~~[illegible]~~ tube with flap
~~[illegible]~~ of Cadmium
Hydroxide, dry - 8.990 wt

50th Run

IV	1/2
1010	1020 -

Run as Iron

~~Mixture for [illegible] was mixed
Seems to be [illegible] quantity
[illegible]~~

~~4 [illegible] 5% [illegible] 50 100 150
590 425~~

Bromuth added to fix
to Bad, 5% B.O.
10% & 15% used

50th Run

	IV	1/2
5%	590	425 -
10%	1175	400 -
15%	2130	3075

5 Gram per tube

100th Run

	IV	1/2
5	45	105 -
10	85	205 -
15 -	85 -	290

150

	IV	1/2
5	15 -	45 -
10	25 -	110
15	15 -	160

4.080 gram pocket of seed iron from igniting Nitrate gives no Current on reading

Ditto Magnetic Oxide from reduction wt Ferric hydrate No Current

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Red Fe Mx - pressed into Cakes at 300 atmospheres put in pockets loose not crimped or Corrugated 4 mi tube 5 gm pockets

5 oth Run

IV	1/2	Bat
30	75	27
60	100	27

Oxide Cadmium in Tubes

Run as 7½ — 10.514 wt
10.432

50 Run

IV	1/2
420	430
425	434

Ent

Cadmium Metal reduced by Zn — put in Tubes with flake run as Grows

15.740 wt
16.110

50 th

	1/2
855	830
1160	1285

400 th Run

	1/2
2200	3425
2200	3425
2440	3790

6412

450 Run

	1/2
1790	3040
1740	2975
2000	3325

50

Dup 4610 Except 10% Red Oxide Fe	4612	1V 750	1V 300	½ V	1V 750	1V 300	½	
	4613	887	1575	2200	650	1500	2000	75%
		1000	1650	2395	907	1645	2260	72.8%
Dup 4610 Except 20% Red Ox Fe	4614	1075	1750	2445	1050	1795	2400	74⅓
	4615	1062	1745	2400	1087	1735	2360	73.5
Dup 4610 Except 33% Red Ox Fe	4616	575	1300	1760	400	1300	1655	78.5
	4617	775	1445	1930	400	1300	1625	
Fe with Na Hg mixed with 25% Red Ox Fe	4618	1000	1650	2315	825	1000	1620	61%
	4619	1000	1535	2215	850	1435	1945	
11% mixed 10% Cerio Ox from igniting Ceric Nitrate 5 gm	4620	912	1590	2130	500	1285	1540	
Dup 4620 15% Cerio Ox	4621	875	1445	2030	112	550	660	
Dup. 4620 25% Cerio Ox	4622	712	1300	1700	50	340	470	

	100	5/2	Ft
4612	1025	1300	1250
4613	1290	1730	1220
4614	1375	1800	1330
4615	1400	1855	1250
4616	840	1010	1145
4617	850	1060	1145

		Gd		½	50	½	100	½	150	½
Fe. 5 gram deep plate. scraped 10 mins / $BiCl_3$ acetone Ang. dried then 6 o'c KOH, ie. ingressed against 2 litres water 6 hours treated $BiCl_3$ acetone 21K2Li	4510	2140		2550	2015	2550	1995	2555	1945	2520
5 gram deep plate soak 10 mins $HgCl_2$ in Acetone, dried, 6 o'clock KOH, dried ingressed 21K2Li against 2 litres treated $BiCl_3$ acetone	4511	2180		2470	2045	2470	1980	2485	1825	2450
5 gram deep plate soaked equal parts $HgCl_2$ + $BiCl_3$ acetone, dried, part in Ammonia ingressed - then exposed 2 litres treated $BiCl_3$ acetone. 21K2Li	4512	2145		2445	2000	2490	Pinhole in plate 2035	2540	2020	2715
5 gram deep plate - dipped 10 mins $HgCl_2$ acetone, then ammonia, then washed in KOH, ingressed against 2 litres treated $BiCl_3$ acetone 21K2Li	4513	2180		2465	2000	2440	Pinhole in plate 1985	2505	1855	2665
5 gram deep plate treated 10 mins $HgCl_2$ acetone dried, part in Ammonia 1 hour, washed out, then exposed 2 litres $BiCl_3$ acetone - Ingressed 21K2Li	4514	2200		2455	2025	2475	2025	2565	1965	2715
~~5 gram deep plate~~ Oil -										
5 gram deep plate soaked equal pts $HgCl_2$ & $BiCl_3$ acetone - dried then KOH, ingressed against 2 litres acetone $BiCl_3$ acetone - 21K2Li	4516	2180		2445	2025	2425	1895	2520	1740	2490

	200	1/2	250		
4510	1825	2365	1755	2270	
4511	1715	2250	1635	2490	
4512	1800	2380	1760	2340	
4513	1715	2490	1640	2430	
4514	1830	2450	1830	2440	
4516	1575	2315			

Pockets of Fz - End Loading

Wt 1050 - #4646 - 7 lb Eight on lamp

Cold Test, 1 Wt 10500

75 Fahr			42 Fahr	
	½			½
2830	3990		2310	3520
2930	4115		2590	3635
2675	3735		2240	3395

50	100	250	500	550	
3080	3100	2900	2090	2400	½
3135	3150	2800	2095	2000	3325
3010	2900	2585	2260	2300	3040
					3454

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ditto 8 lb cat Wt 10800

75 Fahr			42 Fahr	
	½			½
2650	3700	71½%	1890	2745
2580	3400		1950	2850
2475	3535		1675	2460

50	100	250	500	550	
2990	3100	2680	1920	1970	½
2760	2760	2585	1820	1800	3125
2865	2785	2535	1925	2100	3160
					3050

ditto 10 lb col

1st 2 pkts 11.000
Lunch 10.00

10.832

75 Fahr 1/3

2510	3600
2500	3550
2380	3400

42 Fahr 1/2

~~2400~~	3520
1992	1995
2185	3165

50	100	250	500 1/4	550 1/2
3060	3120	2890	2465 3000	2800 3630
2945	2980	2800	2100 3470	2400 3375
2900	2860	2820	2150 3450	2260 3265

ditto 14 lb col. 11.500

75 Fahr 1/2

2300	3000
2450	3475
2480	3450

42 Fahr 1/2

2190	3150
2305	3400
2195	3180

50	100	250	500 1/2	550 1/2
2815	2820	2800	2395 3530	2300 3270
3075	2945	2900	2260 3530	2400 3375
3075	2955	2875	2100 3215	2050 3100

Req 2 Bat from Brackels — 005 stock
Crimped only not corrugated

75 Fahr	1/2	35 Fahr	
2365	3010	1075	9.000 Wt
2570	3595	1700 S	

Loaded in 003 Iron
Crimped not corrug
Crimped between flat surfaces
not reg dia —

		9.590	wt
		10.460	

75 Fahr	1/2	35 Fahr	
B 2600.	3605	1095	
X 1550-	2365	1090	

B 2.66 Temp
X 3.66 Temp —

Iron ring
3 lb wt fall 43/4 inches

	wt.
~~[illegible]~~	
on fifty reads	6.430
	6.174
80 "	6.290
	6.280
120 "	5.490
	5.745
	6.170
140 "	7.195
	7.420

Iron Fe_2O_3 from above ppt.
reduced when 100 mesh reduced
in H. Cooled in H atmosphere
by Nitrogen Cold
100% H_2O — Clogged and burned
8.380 } wt.
8.670 }

Run Rig 75 when at 35 Fahr 3 ice weeks

75	1/2	35 Fahr	1/2
2880	4225		
2970	3970	mean 1930	1680

Duplicate

75	1/2	35 Fahr	
2630	3990	1790	1650
2600	3990	1360	1300

Reg Storage battery 7/2

8250 grms

C 75 annealed, crimped — Corrugated 35 Fahr

1/2

2025 2870 — 1440

8.500 grms

annealed + crimped

75 Fahr — 35 Fahr

1/2

2280 3390 — 1665

7.000 grms

annealed crimped — Corrugated

75 Fahr — 35 Fahr

1/2

1950 2850 — 1330

7.800

Crimped - annealed

75 Fahr — 35 Fahr

1/2

2230 3320 — 1655

8500 cot

Crimped annealed —

75 Fahr — 35 Fahr

1/2

2500 3885 — 1925

8350 cot from

Crimped annealed + Corrugated

75 Fahr — 35 Fahr Decreased around cell

1/2

2100 2970 — 1445 —

Annealing was done in H cot

5 Bat Co — Crimping 15 atmos

Corrugs 200 atmos —

Calliper

Top	Mid	bot
112	112	109
118	116	112
101	102	100
111	110	105
119	120	116
116	117	114

We tried dup the first all Corrugated but it was from of Nunuk home

Meohanical necessary bonding bad (?)

Anhydrous Co peroxide
5 grams rem as 7a

	1/2	
Cols	820	990
	1030	1240
	50th	to V
	1/2	
	635	850
	935	1035

Reg 7a pocket. Silver plated Bad

ditto Copper plated OK

ditto Gold " Bad

ditto Cobalt " Improvement

" Tin OK

" Cadmium Improvement

" Antimony Considerably Improved

Looks as if more degable metals load on pocket's
B. ag all all grind native

Brass plated pocket Cadet Reg

Ferrous Ammonium Sulphate
Weaker than C. ettay 1/2
ignited very light 3 grams
pocket 443 mesh to gram

	1/2	
1330	1935	Water long lat run to pickup
1365	1950	

This is due to excessive fumes

Ignited 80% E. 20 Cu — 5%/Hgo
3.59 to pocket 410 Mesh to gram
This is very fine transition

Drop grey NH4 Mesh
3.5 grams —
fumes — 1 gram 50 —
1625 — 462 Mesh per gram

Holland Soy 68%, Wall Stay

Thank Co absorbs the Hgo
powder, acquires
odd shade in fumes —

After Taking 20 B. Cells
I remark Irons go bad
to Volt in Bismuth cells
but OK to 1/2 V
Irons give good hot
Capacity which falls on
Cold test —

Jnl Chem Soc 1889

Cobalt is less poisonous
than Iron —
Most is Nickel
Ni
Fe
Co least

plating iron packets with
Cobalt probably good
plate Nickel

I remark that Cobalt
plated Irons offer many
Ohms not very much
lower than Nickel
plated Irons

Bismuth Potassium Thiosulphate
is a precipitate
Na Sort Sol

Metantimonate of Potassium
gives colder poisons of
Metantimonate of Sodium
Even dilution —

All dry cells Cadies
Contains Ammonia

K Stearate ~~[illegible]~~ dot in 21 KOH, but very slight in 21 KOH saturated with LiOH

Nickel strips (blanked) 1/2" apart
1 amp — Little Cell
90 cc 40 percent KOH
Thermometer in each cell

Run 2 hours with following rise Amp

15%	Rise	10.3 deg Fah
17		10.6 "
19		11.5 "
21		11.3 "
23		12.5
25		10.9
27		10.1

With same percentage of KOH but with 2 grams LiOH in the Cell

15%	Rise of	11.0 deg
17	"	9.7
19		11.2
21		10.9
23		10.9
25		11.9
27		10.1

Get surge thus and good

E 18 part grids

Armco 30 amp Table,

	Cell Amp	
73	72.5	
75	74.5	25 amp hours
75	94	50
75	98	75
75	101.5	100
76	105.2	125
78	108	150
80	111	175
80	112	200
80	114	225

40 to 70 amp rate about same after 75 amp

50 rate 225 above

1	10.5
1	11.2
1	12.0
1	10 amp in temp
1	50 "
2	225

If we chg E18 at

30 amp heat at end 1.225 temp 12° above Atmos
40 17.5
50 23.7

fully chgd E18 Cold

on dischg 30 amp
125 amperes Taken out
Air temp 76.5
Cell " 90 amp
gave 1.24 to V

7c 534a —
Dischg at 800 ma after long chg.

Dischg at Normal Temp
1350

Dischg 110 deg
2575

" 121 Deg
3000.

" 135 Deg
2570

Ext

Ether capacity is below 1.15-V a very arrow Drop

Short Charge

A Cell 597 -
Short chg
Chg normal dis 135 Tests
gives higher Capacity & 3/100 higher
Volt. than chg & discharge Normal

If chg at 135 Tests & discharge
Normal Capacity is only
65% of chg Normal
& Voltage is less 1.18
average against 1.27

Long Charge

Discharge voltage in this case
are about same
But cells chg hot lose 5%
less Capacity - than chg & discharge
Normal & chg charge
Hot,
the Long chg acts entirely
different from short chg
Why

Yellowish sediment on hard-
rubber in tank 96 is
a very basic permanganate of Iron

Reg tubes, B, Lish group
Chg Cold discharge hot.
Capacity greater Volt good
1288 Volt.

Chg hot discharge Cold
Capacity low
500 ½ 900

Chg & Hot discharge Hot
900 to Volt.

This shows discharge hot OK
but chg hot is very bad
on B, at least

Some B, are poor when chg & discharge
hot. 1200 on a 1350 mah tube

24 hour Chg – Reg Iron against a Nickel strip. But after change to Reversed

1st Reversed

6457	0.0069 ½	2nd chg 33% has quite a deposit of X all others had deposits but no as much
6458	0.0078 "	
6459	0.0135 "	1 gram dissolved in neut to 33%
6460	0.0092 "	6457–8 deposit quite small
6461	0.0200 "	21% only little for 6459
6462	0.0080 "	in spun test in Jena to 33% & results to show little difference with X deposit

2nd Reversed

6457	Very bright Mg gas on using HCl (immersed in H2O, chg)
6458	" "
6459	Bright deposit – deposit gray, shows small bright
6460	Very slight brownish deposit (slightly cleaner in 2 sec in HCl)
6461	Black heavy deposit
6462	" but not so much

as 6461

6457	21K 2 Li
6458	21K 3 Li
6459	21K Saturated Li
6460	21K 1 Li
6461	33% KOH alone
6462	21% KOH alone –

I say that LiOH, tends to + does amalgamate the Hg to Ni strip & thus loosen deposits + helps amalgamate the iron – Iron product, + also removes some scum from Ni strip + causes amalgamation

6461 } shows no sign of
6462 } amalgamation

These two after 1 hour in HCl still shows dull gray deposit, has got KOH with Reg polished pot black from KOH

9 Sep 1st. LiOH Keeps Hg on iron + prevents its migration on reverse – hence iron doesn't go into solution on dissolving permit deposit of oxide inside + on tube perhaps + holds other things back on iron

2nd should call get reversed
very little Iron goes over &
Considerable Hg which wants
to follow the Iron
Any stuff or film of X stuff
Coming on Nickel & Cobalt
up by tendency of LiOH
to clean it & carry amalgamation
Without LiOH considerable
Iron Migrates to cathode
any Hg Coming to the
Reverse of LiOH

I say that I think from
these Expts that Nickel
dissolves in KOH in
presence of LiOH,

I say -
Iron is not affected by charging
hot like the Nickel

Plain Ni in 21% KOH alone
dont give 1/3 of the Capacity
on chg hol (130 Pels)
With 21KOH/2 LiOH it gives
1/2 Capacity
with 21KOH 2 LiOH + Bismuth
3/4 Capacity

Regeneration Bad from Fe, long cells
1 Fe + 4 Ni in small Cow
tried 10 — say Fe does really
go bad (Minutes of gas Evolved)
from Dark Fe wire —
I think also it gets passive
Helium chg & then shorts

The average of the 10 7s when he shooted was

896

8th Run 2289

15 – 2540

16 Run after full chg + shortcked 3 times was 3047 –

Evidently I can be got back to full chg + shortcked several times –

Kate

7s in pockets gives different
Capacities if pockets plated
with different metals plated
with Nickel Brass
A tube with flake Mg was
No good at cold – Strong
be in acts Cold Liquid &
Kills mans – [illegible]
Let Experts on this claim
Brown not plated may
be good

Iron on Silver plated pockets
Bad.

Copper plated about Regular

Gold plated Bad

Cobalt plated slightly better
than Reg

Tin about Reg

Cadmium slightly better
than Reg

Bismuth plated slightly
better than Reg

Antimony plated
considerably better
than Reg

3057 }
3058 } 69 Dr Grolle –

60% Fe
40 Cd
5 Hg –

5 grms

~~Very~~ high efficiency chg
Voltage 165
Watt efficiency 61%
Amp " 80%
1200 to Volt

3063 } 88 Dr Grolle
3064 }

90% Fe

To Antimony

Pockets swelled terribly
& burated strongly

3403 – 95% Fe 5% Antimony Split plate
3406 – 5% HgO

	V	1/2
3475	1330	1985
3476	1365	1950

449 mah to gram

3 grms Fe from ferrous Ammon Sulphate

5% HgO non pyro

3607 } 3.5 grms 5% Hg
3608

80% Fe 20 Copper

447 mah per gram

Non pyrophoric

5 grm Cakes all much lower

Curious Variations

3829 - 80% Fe 20 Aluminum
3830

self heating - 5% Hg

	V	1/2
1420	1850	nearly 400
1420	1710	to mah per

grm Fe

Lots of 80 Fe 20 Sb
went all times of wor
1400 to 100 only

Fe from ferrous Sodium Sulphate, gives highest efficiency yet

1470 long cell
1400 about " 5 grms

3143
3144 } 93.4% ampere efficiency

takes 6 or 8 Runs to bring it up

3445
3446 — 5 HgO — Non pyrophoric

80% Fe 20 Bi

2 1/2 grm pocket

gives 400 to gram of Iron

3459
3460 } 80 Fe 20 Bi Non pyro

400 mah per gram

5 gram pkat gives 334 to mah

3857
3858 Ferrous Ammon Sulfate
Fusion
1/2 1/2
1570 1750
1475 1630
4 grm pkt self heated
Holland says
Watt efay 66.8
The non pyro did not
do as well

Evidently Complex salts
like this fused over highly
porous ferricox
should be exported
with — See Runs —

Fusion
3867
3868 non pyro 5% Hg
1/2
4.5 grms — 1325 1725
1390 1425
Holland Watt
efay 65.8
Cupric
Ferrous
Ammon
Sulphate

3869
3870 4½ grms 1845
1600 1695
1425
Holland 68.5 Watt efay

3885 Ferrous Ammon Sulphide
3886
4 grms
1390 1745 self Heat
1450 1895
Dontsay left Hg —
Holland 68.4 Watt efay

Perfect

4584
4585 } Bi in Iron
4586

goes bad after 100 Runs

	Vrel	150th Run
5% Bi(OH)	590	15
10%	1175	25
15%	2140	15

Awful-

Note 5 gram pkts

4587-88- Iron oxide

No Hg mixed with 10%

Metallic Antimony reduced to fine powder by hydrogen with it put up with 4 Ni tab.

50th Run V
1800
1715
1700

4782-83-84 8.192 av wt

Packets Not Nickel plated

50th	400 Run
2165	1700
2260	2035
2340	1850

Plated Dup

50	400	4779-80-81
2500	2600	8.192 wt
2260	2200	
2500	2500	

Ferthq 5 gram Cake

Req Fe –

	50 Rum	1/m
No Hq	1255 1535	1740 2200
2% Hq	1540 1495	2165 2255
4% Hq	1720 1630	2570 2460
6% Hq	1790 1665	2665 2480
8% Hq	1575 1553	2365 2255
10% Hq	1740 1795	2590 2630
12%	1700 1795	2690 2710
14%	1850 1730	2640 2565
16%	1770 1525	2690 2360

Req Iron thru def screen

	50 Rm	100 Rm
30 on 40	950 1200	
40 on 50	1400 1360	
50 on 60	1400 1345	
60 on 70	1530 1615	
70 on 80	1280 1310	
100 on 180	1860 1900	1640 1560
thru 180 mesh	1770 1640	1480 1530

Reg 72 6% Hg 5 grm Cake

		150 Run	
All fence thru 20 mesh		1570	2320
		1640	2545
"	30 "	1800	
		1800	
"		1895	2730
"	40	1450	2370
"		1570	2500
"	60	1765	2510
"		1775	2620
"	80	1675	2525
"		1890	2750
"	100	1755	2530
"		1465	2095
"	180	1285	1885

Iron run cold is bad no matter how much weight of temp mentioned Reg capacity at 75° allowed very little below 2½ lbs & 4,000 lbs -

Carrugating 72 pockets dont seem to be good Crimped only beats all crinkled -

I remark that there is good mechanical reason Iron goes bad -

Note, given Hg causes [illegible] mentioned in [illegible] abnormal - Hg acts as solvent

Hypophosphite Soda
Apparently don't hurt Grows

See what

3608-9-10

Grows are

90.7
91
87.5
90
} amp Effect

68.1
68.9
66.7
67.8
} watt Effect

Get 72 rum Nos 3143 to 3152

Is the ones with two smooth press
+ 25 altimo Corr up to 125
25 altimo cut altimo

1 = Silver. Nitr with formaldehyde Aq-sol —
2 Nickel The NiOH. by reducing with
Hydrosulphite after getting Good
Conditions use no flake — or use
max amount Hydrosulfite
Comonly possible to want flake —

3 = Second Autoxing Can be reduced
by Hydrosulphite —

4 Small lot for 6 or 8 Silvered Tube
tests Concentrated $CoCl_2$ = Conc hot 150°
Ary + $NiOH)_2$ same temp, soak

5 Also see if $CoCl$ Conc hot will
dissolve $Co(OH)_2$ & how much —

6 = Reg Ni soaks like Y did $CoCl$, but hot
Conc of $NiCl$ $NiOH)_2$ & only fully wet.
Important Expt
Try low & high loading wet —
to see if high Lot will affect
dipping load light —

5 grm Cobalt 4 nickel tube used

Fe 4599-9	10% Cobalt reduced by H		1395
4600-1	15%		590
4602-3	20%		440
4604-5	30% Fe mixed with		165

Show Cobalt does something bad

Fe — 3 lb Tamp fall 4 3/4"

		Cap 75 Falls
80 mesh —	6,285	500
50 "	6,300	450
120 "	5,760	700
180 "	7,300	1100

Shows wants fine Fe for nitrides
Nitrous Ammonium Sulfate

RA Expt 1551 - Fe reduced by H but
nitrs metal, reduced at 800 falls -
H replaced by Nitrogen
gave 1st Cold 5 grm Cat

	✓	1/2
	2065	2815
	2175	3025

ditto reduced 900 deg H displaced by
Nitrogen 2 hours 10% Hg
Fe_2O_3 woolwax 100 mesh
✓ RA 1550 35 gm

2630	3/4		
2600	3990	1780	1650
	3990	1960	1500

[ITEM FOUND IN BOOK]

Chem Soc jnl 1888 p 101 – reducing metallic film – Cobalt passing from surface of a plating sol to air – (Vac semi) gives film which float

Basic Mercuric Salicylate sol in KOH.
without change precipt by CO_2 + acids

Cobalt practically never becomes passive
– Ni is worst Fe next & Co hardly any
Dip iron rod in Conc $CoCl_2$ work rug made in pockets & test ~~20~~ 20" iron.

I say in one of the Ni book
after trying a vast number of solutions
to plate Ni without peeling I thought
trouble was due to Hydrogen & I
put H_2O_2 in sol to combine with the
H + it stops cracking & peeling

[ITEM FOUND IN BOOK]

FEB 24 1910

On Regeneration of PbO and Zn es.

Each cell consists of 1 lead Zn e (from tube cell after 250 hrs), against 4 long tubes, in 7.1 Bo. 1.107 + 11.2 g. SO4 per l.
Zn lead experiment made to find how long Zn es could be brought back regular running, and then how much more short-circuiting would do for them.

CELL	Run #1 IV	Run #1 SV		Run #8 IV	Run #8 SV		Run #15 IV	Run #15 SV		Run #16 IV	Run #16 SV	Run #17 IV	Run #17 SV	Run #18 IV	Run #18 SV
#1630	915		3 runs @ 300 m-a, and 3 @ 750 m-a	2330	3650		2635	3970	7 alternating short-circuited, 3 times	3090	4735	3215	4840	2995	4575
31	725			2170	3355		2560	3820		3250	5005	3375	5045	3090	4995
32	1090			2420	3685		2620	3895		3060	4620	3100	4630	2955	4460
33	1265			2495	4190		2570	3770		3400	4480	3150	4885	3000	4450
34	935			2165	3385		2410	3650		2995	4495	3155	4835	2950	4455
35	1230			2595	3990		2380	3480		2850	4220	2980	4520	2800	4210
36	900			2365	3695		2680	4035		3100	4990	3225	4865	3040	4640
37	700			1995	2960		2475	3650		3045	4635	2920	4275	2815	4195
38	700			1995	3030		2420	3660		2980	4540	2975	4200	2670	4005
39	700			2165	3325		2640	4030		3200	4910	3365	4995	3095	4625
	8916			22269	3516		25549	3798		30951	4458	3151	4499	29916	4431

Results prove that the Zn e does not really go bad but its capacity becomes latent, - thus disuse I believe.

Will make experiments to find effect of charge rate, discharge rate, temperature, etc, on regeneration of lead Zn es.

W. E. H.

That's the only trouble

~~Here's the~~